646E8

COUNTDOWN ACID RAIN

GOVERNMENT REVIEW OF THE EIGHTH PROGRESS REPORTS

(JANUARY 31, 1990)

BY ONTARIO'S FOUR MAJOR SOURCES

OF SULPHUR DIOXIDE

Ontario Ministry of the Environment
May 1990

INTRODUCTION

Four major corporate sources produce over 80% of Ontario's SO_2 emissions. Each source is required to report every six months on the progress made to reduce SO_2 emissions as required by Ontario's Countdown Acid Rain regulations.

The Countdown program was formulated in 1985 and placed an annual SO_2 emissions cap of 885 kt on the province, to be in place by 1994. Specific reductions in SO_2 began in 1986 and culminate in a cap totalling 665 kt for the four major sources by 1994. In the case of Ontario Hydro, an interim cut of 35% was imposed effective 1990, and limits were placed on the total of SO_2 plus nitric oxide (NO) emissions. The Countdown limits are in addition to standards imposed to ensure good ambient air quality. Annual legal limits are summarized in Table 1.

Table 1
Sulphur Dioxide Legal Limits
(thousands of tonnes per year)

	1985	1986	1994
Inco nickel/copper smelter, Sudbury	728	685	265
Falconbridge nickel/copper smelter, Sudbury	154	154	100
Algoma iron ore sintering plant, Wawa	285	180	125
Ontario Hydro fossil fuel power plants, province-wide	390	370	175

Each of the four sources has met the legal limits to date and each has submitted detailed plans for implementing its reduction program, as required by the regulations. The sixth set of company progress reports, received in December 1988 and January 1989, set out the detailed methods and schedules for meeting the emission limits of the Countdown regulations. They were accepted by the government.

Implementation progress reports are still required every six months. This document summarizes the contents of the eighth set of semi-annual company reports and the government response. Previous semi-annual reports are available from the Communications Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario, M4V 1P5, (416) 323-4321.

COMPANY REPORTS AND GOVERNMENT RESPONSES

The progress reports were reviewed by a technical work group drawn from the Ontario Ministries of Environment, Northern Development and Mines (for the metallurgical companies) and Energy (for Ontario Hydro).

The implementation phase of the Countdown program is now well under way, and each of the four regulated companies reports its progress and current status in relation to the 1994 emission limits. A summary of the individual reports, and the Ontario government's response follows.

INCO LIMITED

Regulation 660/85 requires a reduction in SO_2 emissions from Inco's nickel/copper smelter complex in Sudbury to no more than 265 kt for any year after 1993, compared to the current limit of 685 kt per year. The company was also required to examine the feasibility of going beyond the fixed limit of 265 kt by 1994 to a level of 175 kt at some future date. Consequently, the feasibility of continuing technical advances remain a concern of Inco and the government. The government previously accepted Inco's position that a specific interim reduction was not feasible because of the nature of the major process changes being undertaken in order to meet the 1994 emission limit.

The company reported that:

- Major contracts for Engineering and Construction Management for all new facilities have been awarded.
- Design-Build contracts were awarded for the new Oxygen Plant and the Acid Plant, including storage and load-out facilities.
- The Mills Rationalization and the smelter updated project schedules conform to the end-dates of the master schedule as provided in the December 1988 Report.

- Financial commitments for the project are already at $235 million, nearly at 50% of the total projected costs.

- Expenditures to-date now total some $65 million.

- At this time some 350 engineering and construction management personnel are engaged on the project. In addition some 300 trades personnel are carrying out on-site contract work.

Detailed information was provided in the body of the company's report concerning the ongoing development programs.

The government technical group concluded that Inco continues to meet the requirements of Regulation 660/85. It was noted that a conditional Certificate of Approval was issued recently to alleviate Inco's concerns with respect to possible delays in the approval process. In general, it was recognized that major plant scale tests and developmental engineering studies are planned in 1990, and results will be critical in ensuring the success of Inco's Smelter SO_2 Abatement Program. Particular points noted by the reviewers are listed below.

(a) Control of the flow of off-gases to the stack from the converters processing bessemer matte in the new smelting process is of concern, because of multiple units and intermittent operation. Inco should provide details in this area in future reports.

(b) Reduction in gas volume and sensible heat content in the super-stack is recognized by Inco as requiring solution, and fans will be installed as part of the modifications. The reviewers continue to be concerned over plume dispersion and the impact on local air quality. Details in this area should be provided as soon as Inco's consultants have worked out the necessary parameters for modelling emissions.

(c) The company indicated in its seventh progress report that a reduction of about 70% in fugitive emissions would be possible. The eighth report does not address this issue, and the reviewers felt that further information should be given as to whether a 70% reduction remains a realistic target, the effects on local air quality, and the results of modelling studies, if any, to predict possible improvements in local air quality.

(d) The reviewers noted that Inco had not provided further details on progress made in matte-processing FBR off-gas cleaning studies in this report. The reviewers still think this is an important source for obtaining future SO_2 emission reductions beyond the 1994 limit.

(e) The company's eighth report refers to outstanding problems related to the removal of contaminants such as H_2S from gases from the bulk concentrate flash furnaces, but no technical information is provided. The reviewers note that gas cleaning is critical for the success of the Smelter SO_2 Abatement Program. The company should deal with this question in future reports and in future technical discussions with the government in order to demonstrate that Inco has made appropriate progress.

(f) The reviewers noted that Inco must supply relevant technical calculations and drawings as each phase is completed to ensure that the new processes and emission control devices meet MOE Certificate of Approval requirements.

(g) A stack testing program will need to be undertaken by the company in order to address MOE concerns about particulate/trace metal emissions prior to final issuance of a Certificate of Approval.

(h) The reviewers are concerned about the need for adequately quantifying the emissions which by-pass the acid plant during start-up and upsets. This should be addressed in future progress reports.

(i) Meetings between company and ministry technical staff to exchange information between progress reports would be useful. Arrangements will be sought by the technical support group staff for a meeting after the next company report.

FALCONBRIDGE LIMITED

Regulation 661/85 requires Falconbridge to reduce the SO_2 emissions from its Sudbury nickel-copper smelter complex to no more than 100 kt for every year after 1993. The regulation also requires Falconbridge to evaluate the possibility of reducing SO_2 emissions below the 100 kt per year level, and promising areas for further reductions have been identified by the company and Ministry technical staff.

The company's report, covering the period July to December 1989, notes that:

- The 100 kt emission limit at full production will be met by changes in the smelter to capture more SO_2 from the roaster/acid plant system and by modernizing and optimizing the Strathcona Mill, at a currently estimated capital cost of $32 million plus an estimated $7 million for R and D to support the capital projects.

- Separate modernization programs relate to the milling operation and the smelting operation. Changes in the Strathcona Mill will form the basis for potential future reductions of SO_2 by more efficient pyrrhotite rejection.

- In the Strathcona Mill, capital projects in the grinding, flotation and process control areas totalling about $5 million were completed in 1989, out of an estimated capital cost in excess of $13 million. Budgeted expenditures for 1990 are $3.6 million.

- In the smelter, during 1989 capital projects amounting to $1.8 million were completed, with the balance of $13 million slated for future years. The 1990 program is estimated to cost approximately $3.5 million.

Details are provided showing the timing of projects and estimated costs and current status for the roasters, acid plant, electric furnace and converter aisle in the smelter operations and for the grinding circuit, flotation system and process control system in the mill.

The government reviewers concluded that Falconbridge continues to meet the requirements of Regulation 661/85. A Certificate of Approval for the overall undertaking has been issued to the company by the Ministry of the Environment contingent upon a final assessment of the final configuration to ensure compliance with Regulation 308.

The final Certificate of Approval review will include an examination of emission rates of trace metals and particulates as well as SO_2 from all sources during all modes of operation. The final Certificate will also include the requirement for a stack testing program.

The reviewers also noted the following points:

(a) The Strathcona Mill modernization program is scheduled for completion in early 1992. Future company reports should specify the tonnage or percentage contribution of mill modernization to the overall SO_2 emissions reduction program.

(b) Future progress reports should provide additional details on the company's R & D plans for increased pyrrhotite rejection.

(c) A response is still required to questions raised previously, related to the impact of process changes on operating costs, and the rationale for expanding the current single contact acid plant rather than opting for a double contact process which would fix more SO_2 as acid.

(d) The reviewers are concerned about the need for adequately quantifying the emissions which by-pass the acid plant during start-up and upsets. This should be addressed in future progress reports.

(e) Meetings between company and ministry technical staff should be pursued after the next company progress report is issued, to exchange information and resolve some of the above points.

ALGOMA SINTER PLANT, WAWA

The Algoma Steel Corporation operates an iron ore sinter plant at Wawa, about 270 km northwest of Sault Ste. Marie. Regulation 663/85 limits the SO_2 emissions from the operation to 180 kt per year, dropping to no more than 125 kt per year for every year after 1993.

In August 1986, the sinter production capacity at Wawa was down-sized by about half. When combined with a change to lower sulphur feed, this has resulted in much reduced SO_2 emissions.

The company confirms that it will meet the 1994 emission limit by the reduction of the sinter capacity.

The technical review groups concluded that the company continues to have met the requirements of Regulation 663/85, and noted that 1989 emissions at 71 kt were substantially below the 1994 limit of 125 kt. Future emissions are expected to be at about the 80 kt level.

The reviewers noted that the company must apply for a Certificate of Approval if production increases substantially.

Discussions between the company and regional MOE staff will take place, which may clarify future directions prior to the next progress report.

ONTARIO HYDRO

Regulation 281/87 requires Ontario Hydro to meet interim 1990 emission limits as well as imposing a tighter limit for 1994 and beyond. Separate limits are imposed for SO_2 alone and for the sum of SO_2 plus NO (nitric oxide), as shown in Table 2.

Table 2

Period	Regulated Limits SO_2	SO_2 + NO
	(kilotonnes per year)	
1986 to 1989	370	430
1990 to 1993	240	280
1994 and future	175	215

The company reports preliminary figures for 1989 showing SO_2 emissions of 305 kt, and NO emissions of 63 kt. Total emissions were 14.4% below the regulated limit for 1989, and 13 kt below 1988 emissions.

The corporation reports expenditures during 1989 of $227 million on measures contributing to the reduction of acid gas emissions, which included:

- $3.2M for the Environmental Assessment and Definition Phase of FGD (scrubber) retro-fit for the first pair of scrubbers at the Lambton Generating Station.
- $39.2M for flue gas conditioning at Lambton and Nanticoke, required to allow the burning of low sulphur coal.
- $1.6M for research and development.
- $73.0M for control actions including minimizing the sulphur content of U.S. coal, increasing the lignite burn at Atikokan and Thunder Bay TGS, use of flue gas conditioning equipment at Lambton Unit 4 on a continual basis, reduced export sales and increased imports.
- $110.0M for the purchase of low sulphur coal, which was partially for acid gas control.

The corporation also reported that in October 1989 the Board of Directors approved the installation of the first pair of FGD facilities at Lambton TGS, to be installed by 1994 at an estimated capital cost of $450M.

The program schedule for installation of flue gas conditioning equipment shows that Lambton's FGC equipment installation is later than anticipated. (Subsequently, information from the Ministry of Energy is that the schedule has been modified, with four FGC units to be in operation at Lambton and six at Nanticoke by the end of May 1990, and the remaining two units at Nanticoke in July 1990). The time-table for the installation of 8 FGC units at Lakeview TGS runs from 1990 to 1994.

The progress report from Ontario Hydro makes reference to the December 1989 Demand/Supply Plan Report, which covers the next 25 years. The corporation points out that all the cases presented meet the system-wide acid gas emission limits, by using proven FGD equipment on existing fossil fuelled units, low sulphur coal, low-NO_x burners, high-efficiency FGD and selective catalytic reduction for NO_x at proposed future coal-fired stations, and appropriate controls for other new fossil-fired equipment such as natural gas combustion turbines.

The corporation reports that tests were concluded in 1989 at Nanticoke TGS to review the nitrogen oxide emissions estimation methodology. The results showed the particular functional relationship between generating power output and NO emissions, which will be used to calculate NO emissions from Nanticoke in 1990.

A recent Environment Canada study produced different NO emission figures from those determined by Ontario Hydro's calculations. These discrepancies have not been completely resolved to MOE's satisfaction. Ontario Hydro should provide its detailed NO test results and the rationale for their application in establishing NO_x curves, along with internal Ontario Hydro reports on the subject.

The government reviewers concluded that Hydro has met the requirements of Regulation 281/87. Other points noted by the review team are listed below.

(a) Ontario Hydro's semi-annual report was very brief, and future reports should be expanded to provide more detail. In addition, the technical work group would like to meet with Ontario Hydro representatives at least once a year to discuss outstanding issues related to the acid gas abatement program.

(b) Preliminary NO emissions of 63 kt were reported for 1989, and projections of future NO emissions indicate a range of 60-70 kt without allowing for the Environment Canada - Hydro discrepancies. Additionally, the review team noted that fossil fuel generation varies from year to year by as much as 50%, and Hydro's past efforts on NO_x control seem to focus on low-efficiency technology as contrasted to staged air, NO reburning and selective catalytic reduction (SCR) which have higher removal efficiencies. Hydro's future progress reports should provide more detail and commitment on this issue.

(c) The 1988 United Nations - Economic Commission for Europe accord on NO_x emissions, in which Canada was a signatory, calls for a freeze on NO_x emissions at 1987 levels, effective in 1994. Further measures will be undertaken by 1996. Ontario expects to play its part in the required Canadian abatement actions.

(d) Hydro has kept SO_2 emissions considerably below the legal limit of 370 kt in 1989. However the review team noted that the 1990 limit is about 21% lower than 1989 actual emissions, and was concerned that flue gas conditioning equipment be installed and operating in time to allow the burning of more low sulphur coal in order to help meet the 1990 limit.

(e) The reviewers would like additional information from Hydro on "control actions" as listed, particularly for the lowering of the sulphur content of U.S. coals.

(f) Substantial increases were noted between projected and actual 1989 costs, on Hydro's "control actions" sub-grouping in the report. Hydro's next progress report should deal with estimates of future costs of acid gas control.

(g) The Demand/Supply Plan Report, which Hydro refers to in its eighth progress report, is being reviewed separately by the Ministries of Environment and Energy, and comments will be forwarded to Hydro in due course.